What is claimed is:

1. An object recognition system mounted on a vehicle, comprising:

one or more sensors for capturing an image of a road surface;

measuring means for dividing the image into a plurality of windows and measuring distance to the road surface for each of the plurality of the windows;

inclination estimation means for estimating a relative inclination of the road surface against the vehicle based on the distances;

judging means for judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle or the road surface; and

recognition means for recognizing the object based on a result from the judging means.

2. The system of claim 1 wherein said inclination estimation means comprises pitch estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels.

3. The system of claim 2, further comprising:

distance estimating means for estimating the distance from each window to the road surface based on the slope of the pitch estimated by the pitch estimating means and the slope of the roll estimated by the roll estimating means; and

estimated distance memory for storing for each of the windows the distance estimated by said distance estimating means.

4. The system of claim 3 wherein said judging means compares for each window the distance measured by said measuring means and the estimated distance estimated by said distance estimating means to determine relative to each window whether the window represents the road surface.

5. The system of claim 4 wherein said judging means extracts windows that represent object other than the road surface for transfer to said recognition means.

6. The system of claim 2 wherein said pitch estimating means determines pitch angle θ according to the equation;

$$\tan\theta = \frac{n\sum ZiYi - \sum Zi\sum Yi}{n\sum Zi^2 - (\sum Zi)^2}$$

where Yi and Zi are y-axis and z-axis positions respectively of i-th sample and n indicates the number of samples, y-axis being the direction of height of the vehicle and z-axis being the direction of travel of the vehicle.

7. The system of claim 2, wherein said roll estimating means determines roll angle α according to the equation;

$$\tan\alpha = \frac{n\sum XiYi - \sum Xi\sum Yi}{n\sum Xi^2 - (\sum Xi)^2}$$

where Xi and Yi are x-axis and y-axis positions respectively of i-th sample and n indicates the number of samples, x-axis being the direction of breadth of the vehicle and y-axis being the direction of height of the vehicle.

8. An object recognition system mounted on a vehicle, comprising:

one or more sensors for capturing an image of an object;

measuring means for measuring a distance to the road surface for each of a plurality of windows dividing the image;

inclination estimation means for estimating a relative inclination of the road surface against the vehicle based on the plurality of distances; and

correction means for correcting positioning error of said one or more sensors based on an average of the estimated inclination.

9. The system of claim 8 wherein said inclination estimation means comprises:

pitch estimating means for estimating slope of pitching of the vehicle as it travels; and

roll estimating means for estimating slope of roll of the vehicle as it travels;

wherein said correction means comprises:

distance estimating means for estimating the distance from each window to the road surface based on the slope of pitch estimated by the pitch estimating means and the slope of roll estimated by the roll estimating means; and

estimated distance memory for storing for each of the windows the distance estimated by said distance estimating means;

wherein the content of said estimated distance memory is made to change at a large time constant such that secular change of positioning of said one or more sensors is corrected.

10. The system of claim 8 wherein said correction means comprises:

pitch estimating means for estimating slope of pitching of the vehicle as it travels;

roll estimating means for estimating slope of roll of the vehicle as it travels; and

sensor position estimating means for estimating deviation of the position of said one or more sensors from their specified position based on the pitch estimated by said pitch estimating means and the roll estimated by said roll estimating means;

wherein the deviation of the position of said one or more sensors is determined based on moving average of the estimated pitch and the estimated roll.

11. An object recognition method for recognizing an object in front of a vehicle, comprising steps of:

capturing an image in front of the vehicle;

measuring a distance to the road surface for each of a plurality of windows dividing the image and thereby obtaining a plurality of distances;

estimating a relative inclination of the road surface against the vehicle based on the plurality of distances;

judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle or the road surface and thereby giving a judgment result; and

recognizing the object based on the judgment result.

12. The method of claim 11, further comprising a step, performed between the steps of measuring and inclination estimation, of:

extracting windows having captured the road surface from the plurality of windows, and wherein the step of inclination estimation estimates the inclination utilizing distances of the plurality of distances, the utilized distances corresponding to the extracted windows.

13. The method of claim 12, further comprising a step of:

estimating distances to the road surface respectively for the plurality of windows based on the estimated inclination, wherein windows are extracted based on the estimated distances in the step of extraction.

14. The method of claim 11, wherein:

the recognition step further obtains, when the object has been judged as an obstacle in the judging step, a relative speed and a relative distance between the vehicle and the obstacle utilizing the image, and further comprising steps of:

sensing possible collision with the obstacle based on at least one of the relative speed and the relative distance; and

performing collision avoidance action.

15. An object recognition system mounted on a vehicle, comprising:

a camera for capturing an image of an object; and

a controller performing functions of;

dividing the image into a plurality of windows,

measuring a distance to the road surface for each of the plurality of windows and thereby obtaining a plurality of distances,

estimating a relative inclination of the road surface against the vehicle based on the plurality of distances,

judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle or the road surface and thereby obtaining a judgment result, and

recognizing the object based on the judgment result.

16. The system of claim 15, wherein the controller further performs functions of:

extracting windows having captured the road surface from the plurality of windows, and

estimating the inclination utilizing distances of the plurality of distances, the utilized distances corresponding to the extracted windows.

17. The system of claim 16 wherein:

the controller further performs functions of;

estimating distances to the road surface respectively for the plurality of windows based on the estimated inclination, and

storing the estimated distances in a memory; and

wherein the function of extracting the windows is based on the estimated distances stored in the memory.

18. The system of claim 15, wherein the controller further performs functions of:

calculating, when the object has been judged as an obstacle, a relative speed and a relative distance between the vehicle and the obstacle utilizing the image; and

sensing possible collision with the obstacle based on at least one of the relative speed and the relative distance and performing a collision avoidance action.